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IS 6662 (1993): Timber species suitable for wooden packaging - [CED 9: Timber and Timber Stores]

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(दूसरा पुनरीक्षण)

Indian Standard

TIMBER SPECIES SUITABLE FOR WOODEN PACKAGING — SPECIFICATION

(Second Revision)

UDC 674·03 ; 621·798·12

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

December 1993 **Price Group 5**

Timber Stores Sectional Committee, CED 33

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Timber Stores Sectional Committee had been approved by the Civil Engineering Division Council.

This standard was first published in 1972 and revised in 1980. Based on the experience gained in the use of this standard, this second revision has been taken up. Use of same timber species has been recommended for manufacture of one packing case rather than one components of a packing case as recommended in earlier version. Through research a number of species have been identified which are suitable for packing cases. Annex A has, therefore, been modified to include these species appropriately in this second revision of the standard.

The committee responsible for the preparation of this standard is given in Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

TIMBER SPECIES SUITABLE FOR WOODEN PACKAGING — SPECIFICATION

(Second Revision)

1 SCOPE

This standard covers timber species suitable for wooden packaging together with their requirements. It also gives additional information regarding their availability in different parts of India, treatment and other properties which are considered important for the purpose.

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard:

IS No.	*Title*
399 : 1963	Classification of commercial timbers and their zonal classification (*revised*)
401 : 1982	Code of practice for preservation of timber (*third revision*)
707 : 1976	Glossary of terms applicable to timber technology and utilization (*second revision*)
1141 : 1973	Code of practice for seasoning of timber (*first revision*)
6703 : 1972	Glossary of wooden packaging terms

3 TERMINOLOGY

3.0 For the purpose of this standard, definitions given in IS 707 : 1976, IS 6703 : 1972 and the following shall apply.

3.1 Objectionable Knots

a) A live knot in a batten shall be considered objectionable if its diameter along the major axis exceeds one-third the width of the batten; provided such knots do not reach the edge of the batten and are not more than one per 300 mm length of the batten or are situated within 25 mm from a place through which a nail will be driven.

b) A dead knot in a batten shall be considered objectionable if its diameter along the major axis exceeds 6 mm in the case of an unplugged knot or 25 mm in the case of a glued and plugged knot; provided such knots do not reach the edge of the batten and are not more than one per 300 mm length of the batten or are situated within 25 mm from a place through which a nail will be driven.

4 SPECIES OF TIMBER

4.1 All species of timber given in Annex A may be used for the manufacture of shooks.

4.2 Only timbers of Groups I, II and III shall be used for the battens and internal fittings of packing cases.

4.3 Any other suitable timber not included in Annex A may be used for shooks, battens or internal fittings with the prior approval of the purchaser.

4.4 All material of a particular component for a particular design shall be of even thickness, rectangular section, trimmed square at the ends and reasonably smooth.

4.5 As far as possible, only one timber species shall be used for the manufacture of one packing case. However, where different species are required to be used for the manufacture of one packing case, the species shall be selected from the same group. Under no circumstances different species of different groups shall be employed for the manufacture of any one packing case.

4.6 The timber shall be seasoned to a moisture content not exceeding 18 percent and the inclination of the grain shall not exceed 1 in 10. The timber shall be free from centre heart (pith), insect attack, any kind of decay (rot) objectionable knots, warping, splits and any other defects which may reduce the strength or usefulness of the packing case or any of its components. Pinholes (dead infestation) shall be permissible provided they are not of powder post beetles and are reasonably scattered (not concentrated).

4.7 All timbers of non-durable species and all timbers carrying sapwood of durable species shall be given preservative treatment as agreed to between the purchaser and the manufacturer. The treatment shall generally conform to IS 401 : 1982.

5 CLASSIFICATION AND AVAILABILITY OF TIMBERS

5.1 The timbers listed in Annex A have been classified according to their comparative suitability coefficients for packing cases, durability, etc, and their availability in different zones of the country. The average mass of timbers at 12 percent moisture content in kg/m^3 are also given in col 4 of Annex A (*see* IS 399 : 1963 for general guidance).

5.1.1 *Comparative Suitability Coefficient for Packing Cases*

In col 5 of Annex A, comparative suitability coefficients for packing cases of different timbers with respect to the value of teak taken as 100, are given for the general guidance. These have been evaluated taking into consideration various physical and mechanical properties which are considered important for selecting a species for wooden packing cases. The timbers for wooden packaging are categorised under four groups as indicated below:

Group I	Comparative suitability coefficient 95 and above
Group II	Comparative suitability coefficient 80 and above but below 95
Group III	Comparative suitability coefficient 70 and above but below 80
Group IV	Comparative suitability coefficient below 70

NOTE — While using the comparative suitability coefficients for packing cases, it may be remembered that they serve only as a guide for selection of relatively superior or inferior species, from physical and mechanical aspects. Higher the figure, the more suitable it is for the packing cases. It should also be kept in mind that these figures do not serve as design criteria or for deciding dimensions of the shooks or other components of the packing cases.

5.2 Durability

In col 6 of Annex A, the durabilities of timbers are indicated for general guidance. The timber species have been classified, as stated below, depending upon the average life of the test specimen of different species tested under exposed conditions in 'graveyard' tests:

High	Timbers having average life of 120 months and over
Moderate	Timbers having average life of less than 120 months but of 60 months or over
Low	Timbers having average life of less than 60 months

5.3 Treatability

In col 7 of Annex A, the treatabilities of timbers are indicated for the general guidance. The timbers have been classified, as stated below, based on the pressure treatments of various timbers with creosote-crude oil mixtures and with water soluble preservatives under conditions of treatment which are normally used for these processes:

a) Heartwood easily treatable;

b) Heartwood treatable, but complete penetration of preservative not always obtained;

c) Heartwood only partially treatable;

d) Heartwood refractory to treatment; and

e) Heartwood very refractory to treatment, penetration of preservative being practically nil from side or end.

5.4 Refractoriness to Seasoning

In col 8 of Annex A, the refractoriness to seasoning of timbers are indicated for general guidance (*see* IS 1141 : 1973 for further information). The timbers have been classified, as stated below, depending upon their behaviour with respect to cracking, splitting and drying rate:

a) Class A : Highly refractory

b) Class B : Moderately refractory

c) Class C : Non-refractory

NOTE — Highly refractory timbers are slow and difficult to season free from surface and end cracking. Moderately refractory timbers may be seasoned free from surface and end cracking within reasonably short periods, given a little protection against rapid drying conditions. Non-refractory timber may be rapidly seasoned free from surface and end-cracking even in the open air and sun. If not rapidly dried, that develop blue stain and mould on the surface.

5.5 Workability

In col 9 of Annex A the workability of different timbers depending on their working qualities particularly with experience of handworking are indicated for general guidance. Timbers have been grouped in three categories as indicated below:

a) Easy to work and finish;

b) Moderate to work and finish; and

c) Difficult to work and finish.

5.6 Availability of Timbers

5.6.1 The availability of timbers is categorised under three classes as indicated below:

x — Most common, 1 415 m^3 and more per year

y — Common, 355 m^3 to 1 415 m^3 per year

z — Less common, below 355 m^3 per year

5.6.2 In col 10 to 14 of Annex A, the availability of different timbers in North, East, Central, West and South Zones respectively are indicated for the general guidance. These zones roughly comprise the following areas:

North zone	Jammu and Kashmir, Himachal Pradesh, Punjab, Haryana, Delhi, Uttar Pradesh and Rajasthan
East zone	Assam, Manipur, Tripura, West-Bengal, Bihar, Orissa, Nagaland, Arunachal, Andamans (also Sikkim and Bhutan), Meghalaya
Central zone	Madhya Pradesh, Vidharbha areas of Maharashtra and North-East parts of Andhra Pradesh (that is, Godavari delta area)
West zone	Maharashtra except Vidharbha areas, Gujarat and North-West part of Karnataka
South zone	Tamil Nadu, Kerala, Andhra Pradesh (except Godavari delta area) and Karnataka (except North-West part)

6 SELECTION OF MATERIALS

6.1 Shooks

The selection of suitable species for shooks of packing cases depends on several factors, for example, mass and cost of contents, design and size of the packing case, nature and type of load, means of handling, modes of transportation, destination and the period for which the packing cases are kept stored (with and without contents), but generally the mass of contents and type of load (*see* Annex B) are the governing factors. A general guide for the selection of the species according to the mass of contents and type of load is given in Table 1.

Table 1 Guide for Selection of Species

Mass of Contents kg	Group of Timber	
	Easy and Average Type of Load	Difficult Type of Load
Up to 50	IV	III
Over 50 up to 100	III	II
Over 100 up to 150	II	I
Over 150 up to 250	I	I

6.2 Battens and Internal Fittings

6.2.1 The battens and internal fittings shall preferably be of the same species as selected for the shooks of packing cases. However, where different species are required to be used for the battens, etc, the species shall be selected from the same group of timbers. For packing cases manufactured from the shooks of Group IV timbers, Group III timber shall be used for this purpose, if required.

6.2.2 Group IV timbers shall not be used for battens and internal fittings without the prior consent of the purchaser in writing.

7 DELIVERY

Unless otherwise specified, the material shall be delivered in the required sizes firmly bundled together.

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ANNEX A

(*Clauses* 4.1, 4.3, 5.1, 5.1.1, 5.2, 5.3, 5.4, 5.5 *and* 5.6)

TIMBER SPECIES SUITABLE FOR WOODEN PACKAGING

Sl No.	Botanical Name	Trade Name	Average Mass at 12% Moisture Content in kg/m³	Comparative Strength Coefficient for Packing Case with Respect to Teak Taken as 100	Durability	Treatability	Refractoriness to Seasoning	Workability	Availability in Different Zones				
									North	East	Central	West	South
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Group I — Comparative Suitability Coefficients 95 and Above													
1.	*Acacia tortilis*	israel babul	852	103	—	—	—	Difficult	—	—	—	—	—
2.	*Acrocarpus fraxinifolius*	mundani	690	96	Low	c	B	Easy	—	z	—	—	z
3.	*Albizia procera*	safed siris	640	99	Moderate	c	B	Difficult	y	y	z	z	z
4.	*Aphanamixis polystachya*	pitraj	690	100	High	—	B	—	—	y	—	y	z
5.	*Betula* spp.	birch	643	96		—	B	Moderate	y	z	—	—	—
6.	*Careya arborea*	kumbi	785	111	High	—	A	Moderate	—	x	—	—	—
7.	*Dysoxylum malabaricum*	white cedar	720	95	High	—	B	Easy	—	—	—	z	y
8.	*Eucalyptus* hybrid	mysore gum	772	98	Low**	c**	—	Moderate	—	—	—	—	—
9.	*Lagerstroemia parviflora*	lendi	755	97	Low	c	A	Easy	z	x	x	z	z
10.	*Morus laevigata*	bola	655	104	—	—	B	—	—	z	—	—	—
11.	*Prosopis cineraria*	jhand	701	96	—	—	A	Difficult	—	—	—	—	—
12.	*Stereospermum* spp.	padri	720	96	Low	—	B	Difficult	y	z	y	z	y
13.	*Syzygium* spp.	jaman	785	109	Moderate	c	A	Moderate	x	y	y	y	y
14.	*Tamarix articulata*	frash	708	95	—	—	—	Difficult	—	—	—	—	—
15.	*Terminalia alata*	laurel	842	96	High	b	A	Easy	x	x	x	x	x
16.	*Terminalia bellirica*	bahera	815	97	Low	b	B	Easy	x	x	x	y	x
17.	*Zanthoxylum rhetsa*	mullilam	735	113	High	—	B	—	—	y	—	z	z
Group II — Comparative Suitability Coefficients 80 and Above but Below 95													
18.	*Adina cordiforlia*	baldu	690	89	Low	a	B	Easy	x	x	x	y	x
19.	*Albizia lebbeck*	kokko	640	88	High	c	B	Difficult	y	x	z	z	y
20.	*Amora* spp.	amari	625	94	Moderate	—	B	Easy		y	—	—	—
21.	*Artocarpus heterophyllus*	kathal	595	85	High	—	B	Moderate	z	y	z	z	y
22.	*Artocarpus hirsutus*	aini	595	85	Low	—	B	Moderate	—	—	—	y	y
23.	*Artocarpus lakoocha*	lakooch	647	91	High	—	B	—	—	z	—	—	z
24.	*Bischofia javanica*	uriam	755	82	Low	c	A	Moderate	—	y	—	z	z
25.	*Boswellia serrata*	salai	575	89	Low	c	C	Moderate	y	x	x	y	—
26.	*Bridelia* spp.	kassi	595	88	Moderate	c	B	Moderate	y	x	—	—	z
27.	*Calophyllum* spp.	poon	646	87	Moderate	c	B	Moderate	—	—	—	z	y
28.	*Canarium* spp.	white dhup	640	82	Low	—	C	Easy	—	—	—	z	y
29.	*Chukrasia velutina*	chickrassy	675	85	Low	c	B	Difficult	—	z	—	z	z
30.	*Cinnamomum* spp.	cinnamon	655	85	Low	—	B	Easy	—	z	—	z	—
31	*Cullenia excelsa*	karani	640	85	Low	b	C	Easy	—	—	—	—	y
32	*Dillenia* spp.	dillenia	625	91	Low	—	B	Easy	—	x	—	y	—
33.	*Dipterocarpus macrocarpus*	hollong	735	93	Low	a	B	Easy	—	x	—	—	—
34.	*Dipterocarpus* spp.	gurjan	785	83	Low	b	B	Easy	—	x	—		
35.	*Evodia lunuankenda*	kambli	[illegible]43	82†	—	—	B	—	—	—		—	y
36.	*Exbucklandia populnea*	pipli	688	90	Low**	—	C	Easy	—	z		—	—

ANNEX A (*continued*)

Sl No.	Botanical Name	Trade Name	Average Mass at 12% Moisture Content in kg/m³	Comparative Strength Coefficient for Packing Case with Respect to Teak Taken as 100	Durability	Treatability	Refractoriness to Seasoning	Workability	Availability in Different Zones				
									North	East	Central	West	South
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
37.	*Guruga pinnata*	garuga	610	86	Low**	c	B	Easy	z	y	x	x	z
38.	*Grevillea robusta*	silver oak	640	80†	—	—	B	—	z	—	—	—	y
39.	*Hevea brsailiensis*	rubber wood	624	89‡	Low**	a**	C**	Easy	—	—	—	—	—
40.	*Holarrhena anti-dysenterica*	kurchi	497	82	—	—	B	—	—	y	—	—	—
41.	*Holoptelea integrifolia*	kanju	595	82	Low	b	B	Easy	x	y	z	—	z
42.	*Lagerstroemia hypoleuca*	pyinma	610	82	Moderate	—	B	—	—	x	—	—	—
43.	*Lagerstroemia lanceolata*	benteak	675	85	High	c	B	—	—	—	—	y	x
44.	*Lagerstroemia speciosa*	jarul	625	89	Moderate	c	B	Easy	—	y	—	z	z
45.	*Machilus* spp.	machilus	530	80	Low	c	B	Easy	—	z	—	z	y
46.	*Mangifera* spp.	mango	690	89	Low	a	B	Easy	x	x	y	y	x
47.	*Melia azedarach*	persian lilac	595	92	Low	—	B	Easy	z	—	—	—	—
48.	*Miliusa tomentosa*	hoom	735	94	Low	—	B	—	—	—	—	z	—
49.	*Millingtonia hortensis*	nimi chembeli	570	84	—	—	B	Easy	—	—	—	—	—
50.	*Mitragyna parvifolia*	kaim	655	88	Low	b	B	Easy	y	y	x	y	y
51.	*Palaquium ellipticum*	pali	640	88	Moderate	e	B	Easy	—	—	—	—	x
52.	*Phoebe* spp.	bonsum	530	80	Low	c	B	Easy	—	z	—	—	—
53.	*Polyalthia* spp.	debdaru (nedunar)	640	94	Low	—	B	—	—	z	—	z	z
54.	*Pterospermum acerifolium*	hathipaila	592	92	Low	c	B	Easy	z	y	—	—	—
55.	*Pterygota alata*	narikel	593	92†	—	—	C	Easy	—	y	—	—	z
56.	*Schima wallichii*	chilauni	655	89	Low	d	B	Easy	—	x	—	—	—
57.	*Shorea assamica*	makai	575	88	Low	c	B	Easy	—	y	—	—	—
58.	*Sideroxylon longepetiolatum*	lambapatti	542	82	Low	a	C	—	—	y	—	—	—
59.	*Sonneratia apetala*	keora	625	—	—	—	B	Easy	—	y	—	—	—
60.	*Terminalia bialata*	white chuglam	705	88	Low	c	B	Easy	—	x	—	—	—
61.	*Terminalia myriocarpa*	hollook	610	84	Low	a	B	Easy	—	x	—	—	—
62.	*Terminalia procera*	white bombwe	610	85	Low	b	B	Easy	—	x	—	—	—
Group III — Comparative Suitability Coefficients 70 and Above but Below 80													
63.	*Abies pindrow**	fir	450	72	Low	d	C	Easy	x	—	—	—	—
64.	*Acer* spp.	maple	575	79	Low	—	B	Easy	y	z	—	—	—
65.	*Aesqulus indica*	horsechestnut	515	75†	—	—	B	—	x	—	—	—	—
66.	*Ailanthus intagrifolia*	go kul	415	70	Low		C	Easy	—	z	—	—	—
67.	*Anthocephalus chinensis*	kadam	485	78	Low	a	C	Easy	—	x	—	—	z
68.	*Artocarpus chaplasha*	chaplash	515	78	Moderate	d	B	Easy	—	x	—	—	—
69.	*Brussonetia papyrifera*	paper mulbery	506	74	—	—	C	Easy	—	—	—	—	—
70.	*Cedrus deodara**	deodar	545	78	High	c	C	Easy	x	—	—	—	—
71.	*Cupressus torulosa**	cypress	515	71	High	c	C	—	y	—	—	—	—
72.	*Duabanga grandiflora*	lampati	515	74	Low	c	C	Easy	—	x	—	—	—
73.	*Elaeocarpus* spp.	rudrak	480	73	—	—	C	—	—	—	—	z	z
74.	*Ficus* spp.	fig	465	72			C	—	z	z	z	—	—
75.	*Gmelina arborea*	gamari	515	79†	High	—	B	Easy	y	y	y	z	y

ANNEX A (*concluded*)

Sl No.	Botanical Name	Trade Name	Average Mass at 12% Moisture Content in kg/m³	Comparative Strength Coefficient for Packing Case with Respect to Teak Taken as 100	Durability	Treatability	Refractoriness to Seasoning	Workability	Availability in Different Zones				
									North	East	Central	West	South
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
76.	*Hymenodictyon excelsum*	kuthan	494	73	Low	c	C	Easy	z	z	z	z	z
77.	*Knema* spp.	jathikai	515	70	Low	—	C	—	—	—	—	—	—
78.	*Lannea coromandelica*	jhingan	575	77	Low	e	B	Difficult	z	x	x	y	y
79.	*Michelia* spp.	champ	495	76	Low	—	B	Easy	—	x	—	—	z
80.	*Picea smithiana**	spruce	472	70	Low	d	C	Easy	x	—	—	—	—
81.	*Pinus kesiya**	khasi pine	513	78	Low	—	B	Easy	—	z	—	—	—
82.	*Pinus roxburghii**	chir	550	73	Low	b	C	Easy	x	—	—	—	—
83.	*Pinus wallichiana**	kail	515	70	Low	c	C	Easy	x	—	—	—	—
84.	*Sapium baccatum*	seleng	495	70	—	—	C	—	—	y	—	—	—
85.	*Toona ciliata*	toon	515	77	Low	c	B	Easy	x	y	—	z	y
86.	*Tsuga dumosa**	hemlock	449	70†	—	—	C	Easy	—	y	—	—	—
87.	*Ulmus wallichiana*	elm	530	78	Low	—	C	Easy	z	—	—	—	—
88.	*Vateria indica*	vellapine	595	73	Low	e	C	Easy	—	—	—	z	x
Group IV — Comparative Suitability Coefficients Below 70													
89.	*Abies densa**	red fir	412	66†	—	—	C	—	—	x	—	—	—
90.	*Ailanthus* spp.	maharukh	415	67	—	—	C	—	—	—	z	z	y
91.	*Albizia chinensis*	siris	400	67†	Low	e	B	—	—	z	—	—	z
92.	*Alnus* spp.	alder	370	67	—	—	C	Easy	z	z	—	z	y
93.	*Alstonia scholaris*	chatian	415	64	Low	—	C	Easy	z	z	—	z	y
94.	*Antiaris toxicaria*	upas	395	66	—	—	C	—	—	—	—	—	z
95.	*Bombax ceiba*	semul	385	69	Low	a	C	Easy	x	x	x	y	y
96.	*Cryptomeria japonica**	suji	264	52†	—	e	C	Easy	—	x	—	—	—
97.	*Endospermum* spp.	bakota	430	67†	Low	—	C	—	—	y	—	—	—
98.	*Kydia calycina*	pula	385	65	—	—	C		z	x	y	y	y
99.	*Lophopetalum wigthtianum*	banati	450	67	Low	—	C	Easy	—	—	—	z	z
100.	*Parishia insignis*	red dhup	484	68	Low	—	C	Easy	—	x	—	—	—
101.	*Populus* spp.	poplar	450	65	—	—	C	—	z	—	—	—	—
102.	*Pterocymbium tinctorium*	papita	314	58†	Low	—	C	Easy	—	x	—	—	—
103.	*Spondias* spp.	amra	412	68	Low	a	C	Easy	—	z	—	—	—
104.	*Trewia nudiflora*	gutel	450	69	Low	—	C	Easy	y	z	—	z	y
105.	*Tetrameles nudiflora*	maina	324	59†	Low	a	C	Easy	—	x	—	z	x

*Coniferous timbers.

†Tentative value (based on Standard Specific Gravity-Suitability Coefficient relationship).

**Tentative.

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ANNEX B

(*Clause* 6.1)

TYPE OF LOAD

B-1 FACTORS

B-1.1 The prime factor influencing proper wooden packing case design is the physical attributes of the load. This includes the mass, size, fragility, shape and capacity of supporting the packing case. For the purpose of classifying the contents which may be packed in wooden packing case, three types of load categories have been defined. These are 'Easy load', 'Average load' and 'Difficult load'.

B-2 EASY LOAD

B-2.1 Easy load consists of contents having low to moderate density and filling the inside of the packing case completely. The contents also consist of articles of sufficient strength to withstand the forces encountered in handling and transportation, and are of such shape as to fully contact all faces of the packing case. Such items as boxed articles, chests or kits of tools, and wooden cabinets are examples of this type of load.

B-3 AVERAGE LOAD

B-3.1 Average load consists of items which are moderately dense and which require a reasonable amount of protection Items of this type may either be packed directly into the outer container or in an intermediate package which aids in supporting the faces of the outer container. The items themselves or their packages must provide a moderate amount of support for all faces of the packing case in order to be classified as an average load. In this group fall items such as metal cans, bottles individually cushioned, hardware and numerous other items which are first packed in individual cartons.

B-4 DIFFICULT LOAD

B-4.1 Difficult load consists of items which are highly concentrated or require a high degree of protection. Items in this category furnish no support to the faces of the packing case, rather, in many instances, tend to apply concentrated forces to the packing case surfaces. Bolts, nuts and other dense items which are free to shift or flow, as well as delicate instruments, machine parts, valves and fittings, machine assemblies and accessories which have to be held in place by bracing and bolting, heavy wrenches which exert highly concentrated forces on two opposite faces of the packing case and others which do not completely fill the packing cases fall into this class.

ANNEX C

(Foreword)

COMMITTEE COMPOSITION

Timber Stores Sectional Committee, CED 33

Chairman
Dr A. N. Nayer
C-59, Inderpuri, New Delhi 110012

Members	*Representing*
Shri Pradeep Agarwal	Wood Preservers (P) Ltd, Nagpur
Shri S. K. Chanda	Industrial Wood Works (Pvt) Ltd, Calcutta
Shri Kapal K. Chaudhari	S. P. Timber Industries, Yamuna Nagar
Dr T. C. Chaudhary	Tea Board, Calcutta
Shri A. K. Das	Directorate General of Technical Development, New Delhi
Shri A. K. Chatterjee (*Alternate*)	
Shri S. N. Dhir	In Personal Capacity (*134, Doon Vihar, Dehra Dun*)
Dr P. M. Ganapathy	Indian Plywood Industries Research and Training Institute, Bangalore
Dr H. N. Jagadeesh (*Alternate*)	
Shri Satya Narain Garg	Govind Narain & Brothers, Kanpur
Shri Suresh Narain Garg (*Alternate*)	
Shri M. P. Ghai	Directorate General of Ordnance Factories, Gun Carriage Factory, Jabalpur (M P.)
Shri S. Ghose	Indian Tea Association, Calcutta
Shri M. Das Gupta (*Alternate*)	
Dr Inder Dev	FRI (Wood Preservation Branch), Dehra Dun
Shri P. K. Jain	Jaynes Cheap Stores Supply Co, Delhi
Shri U. B. Kanchan	Ministry of Defence (DRDO)
Shri Ravindra Kumar (*Alternate*)	
Shri P. N Mehrotra	Satna Timbers, Kanpur
Shri Narendra Mehrotra (*Alternate*)	
Shri C. N. Pandey	FRI (Wood Seasoning Branch), Dehra Dun
Lt-Col M. V. Rangaiah	Directorate General of Border Roads
Shri S. S. Rajput (Convenor CED 33 : 1)	Forest Research Institute, Dehra Dun
Shri N. K. Shukla (Convenor CED 33 : 2)	Forest Research Institute, Dehra Dun
Shri K. P. Singh	Ministry of Railways (Railway Board)
Shri K. B. Goyal (*Alternate*)	
Shri J. K. Sinha	Ministry of Defence (DGQA)
Shri Ram Chander (*Alternate*)	
Shri V. Subramaniam	Central Public Works Department, New Delhi
Shri R. S. Sethi (*Alternate*)	
Shri R. C. Tandon	FRI (Timber Mechanics Branch), Dehra Dun
Dr M. C. Tewari	In Personal Capacity (*103, Vasant Vihar, Dehra Dun*)
Shri N. K. Upadhyay	Directorate General of Supplies & Disposals
Shri Y. R. Taneja, Director-in Charge (Civ Engg)	Director General, BIS (*Ex-officio Member*)

Secretary
Shri R. S. Juneja
Deputy Director (Civ Engg), BIS

Wooden Containers Subcommittee, CED 33 : 2

Convener	
Shri N. K. Shukla	Forest Products Division (Timber Mechanics), Forest Research Institute, Dehra Dun
Members	
Shri P. G. Deshmukh	Indian Institute of Packaging, Bombay
Shri P. L. Nagarseker (*Alternate*)	
Shri A. K. Dwivedi	Directorate of Horticulture, Govt of Himachal Pradesh, Shimla
Shri C. R. Sharma (*Alternate*)	
Capt D. R. Khare	Indian National Shipowners Association, Bombay
Shri M. K. Balagopalam Nair	Rubber Board, Kottayam (Kerala)
Dr A.N. Nayer	Skan Packaging Consultants, New Delhi
Shri Sanjay K. Nayer (*Alternate*)	
Shri O. P. Prahaladaka	Hitachi-KK Manufacturing Co, Calcutta
Shri C. P. Parahaladaka (*Alternate*)	
Shri Ravi Chandra	Bharat Heavy Electricals Ltd, Bhopal
Shri R. M. Gupta (*Alternate*)	
Shri R. V. Iyer (*Alternate*)	
Shri J. K. Sinha	Ministry of Defence (DGQA)
Shri Gulam Alam (*Alternate*)	
Shri R. C. Tandon	Forest Products Division (Timber Mechanics), Forest Research Institute, Dehra Dun

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